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(54) Ventilating cabinets for electronic components

(57) Electronic components 18 housed in a cabinet are cooled by directing an airflow over the components. The distribution and the direction of the airflow is controlled by deflector vanes 21 extending at an angle to the incident air flow induced by a fan 14. Undesirable turbulence resulting in uneven and decreased cooling effect is reduced by providing apertures 24 in the vanes which are effective to reduce the pressure differential between opposite sides of the vanes.

Fig.1.

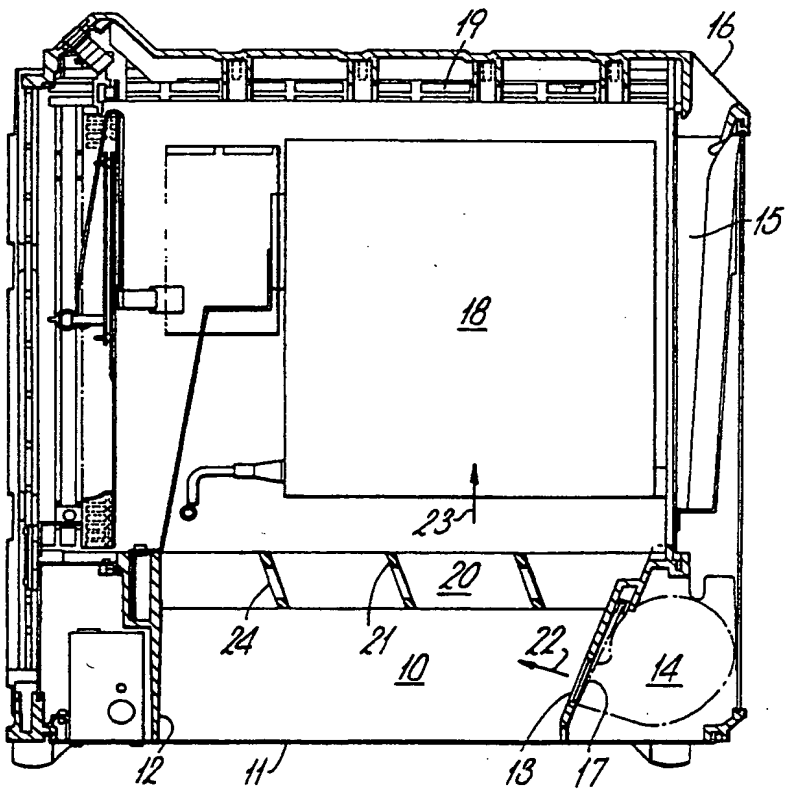

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Fig.1.

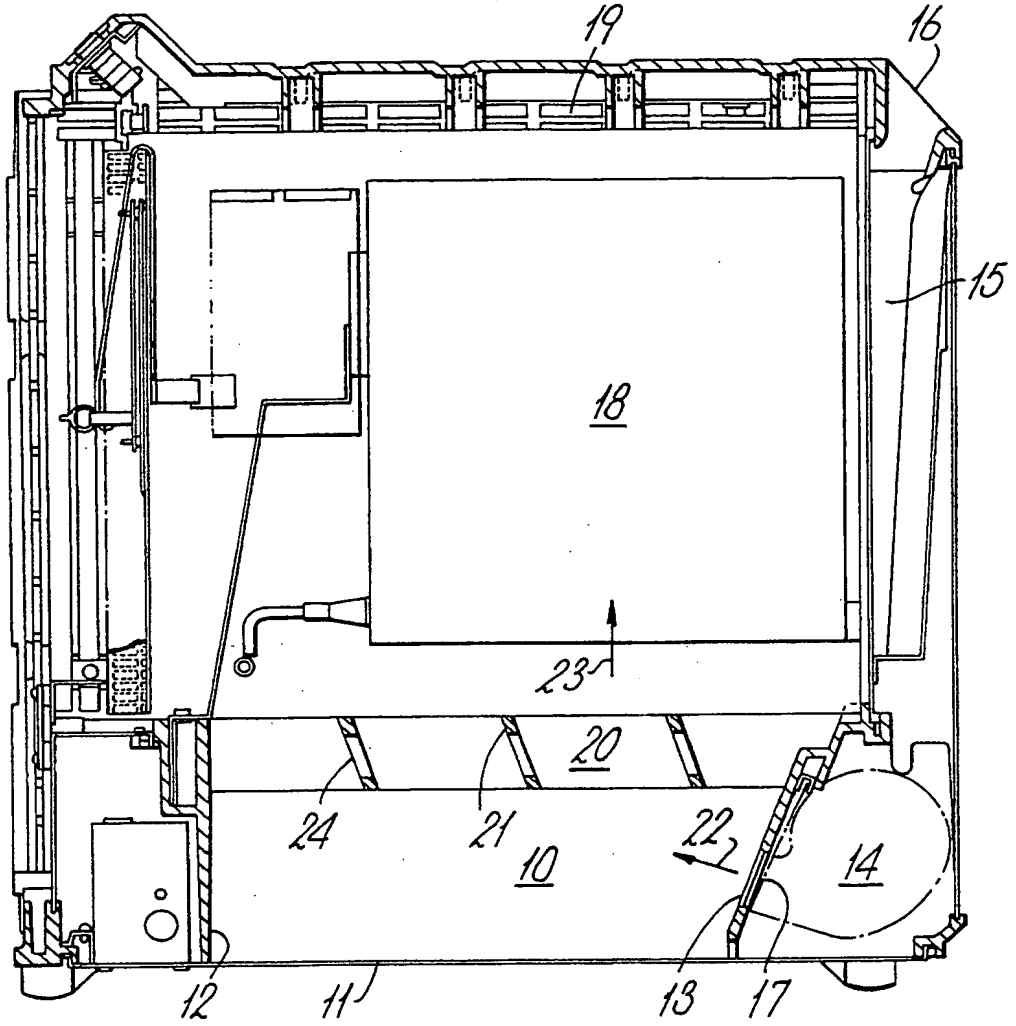
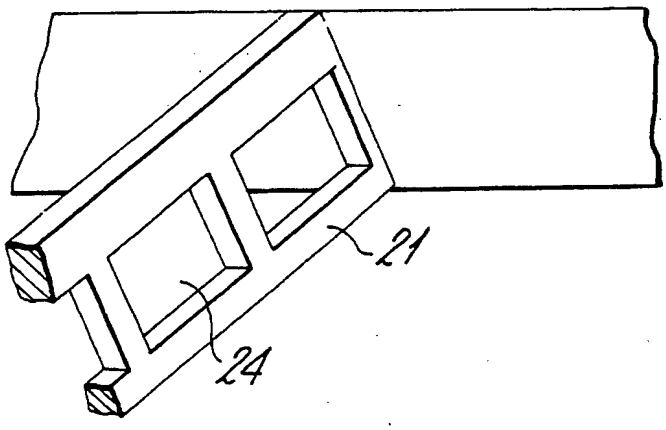


Fig.2.



SPECIFICATION

Air flow deflecting and distribution

This invention relates to deflecting an air flow and in particular to means for deflecting and distributing an air flow within an enclosure.

In electronic equipment heat is generated by components from which the equipment is constructed. This causes a rise in temperature of the components which may result in fatal damage to the components. Semi-conductor components are particularly susceptible to such damage. Accordingly, it is necessary to remove the heat from these components at such a rate that the temperature of the components is kept below a critical value. A common method of removing heat is to direct a flow of air over the components and then to vent the heated air to the external environment. However, in equipment such as electronic computers it is often desired to pack the components as densely as possible within a cabinet in order to keep the overall dimensions of the equipment as small as possible. A consequence of this is that a relatively large quantity of heat needs to be removed from the enclosure and it is necessary to ensure that the air flow is so distributed through the cabinet that all the components are maintained below a temperature at which they may be subject to damage. The components of such equipment are usually mounted on printed circuit boards supported in a generally parallel spaced relationship so that the boards divide the interior of the cabinet into a number of ducts. These boards may carry further circuit boards extending perpendicular thereto which in turn carry electronic components. In order to produce the desired flow of air over the components, one or more fans are provided and the air flow is directed over the components by means of deflectors located at appropriate positions within the cabinet. However, it has been found that if deflectors presenting a continuous face are positioned in the air flow to control the distribution and direction of the air flow, low pressure regions are formed adjacent the rear face of the deflectors and this results in undesirable turbulence with consequent recirculation of air within the enclosure. This recirculation of air within the enclosure results in a non-uniform and decreased cooling effect.

According to one aspect of the invention, means for deflecting an airflow includes: a vane having a front surface extending at an angle to an incident airflow to deflect the air and cause it to flow at an angle to the incident airflow and having a rear surface; and at least one aperture in the vane effective to reduce pressure differential between the front and rear surfaces.

According to a further aspect of the invention, a cabinet for housing electronic equipment includes means to produce an airflow through the cabinet; a plurality of deflector vanes situated at locations within the cabinet and arranged to distribute and direct the airflow over the components, each vane being disposed at an angle to the incident airflow at its location and having at least one aperture effective to reduce pressure differential between opposite sides of the vane.

An embodiment of the invention will now be described by way of example with reference to the drawing in which:

Figure 1 is a section through the cabinet of an electronic computer

Figure 2 is a view of an enlarged scale of a part of the structure of the cabinet incorporating a vane.

Referring now to the drawings, a cabinet for a computer is provided with a plenum 10 at the base which is closed at its underside by a plate 11 and is bounded on its sides by walls of which front and rear walls 12 and 13 are shown. The rear wall supports one or more fan units 14 which draw air through an air inlet duct 15 extending down from an optining 16 at the rear of the cabinet to provide air flow through an aperture 17 into the plenum 10. Above the plenum there is disposed an arrangement of air flow deflectors and guides to distribute the air flow from the plenum upwards to flow past printed circuit boards carrying electronic components which in operation generate heat. After passing the circuit boards, which are arranged in special parallel vertical planes extending in a direction from the front to the rear of the cabinet as shown by reference 18, the air flow is vented to the ambient environment through vent slots 19 in the side panels of the cabinet. In addition to the circuit boards 18, these boards carry smaller so-called daughter boards extending in vertical planes perpendicular to the boards 18.

Since components carried by the circuit boards are susceptible to damage due to overheating it is necessary to ensure that there is a sufficient flow of air past every one of these components to provide the necessary cooling effect to them. Accordingly, a plate 20 is disposed below each printed circuit board 18 in the plane of the board so that the plates form a downward extension of the boards. These plates 20 support deflector vanes 21 which extend between the plates 20, or at each end of the cabinet, the vanes extend between one of the plates 20 and a side wall of the plenum 10. These vanes therefore extend across the flow of air from the fan units 14 and assist in redirecting the air flow from a direction indicated by arrow 22 in the plenum 10 to an upward flow indicated by arrow 23 between the circuit boards 18. If

the vanes present a continuous face to the incident air flow it has been found that a low pressure region is formed behind each vane. This results in undesired turbulence in the air flow. The turbulence causes a recirculation of air between the circuit boards. Consequently air which has already been heated may be directed past some of the components. This can result in localised decrease in the cooling effect so that components in these localities may overheat. Therefore, to prevent formation of these low pressure regions, the vanes 21 are formed with apertures 24. It is believed that the configuration of the apertures is not critical provided that a sufficient communication is provided between the front and rear faces of the vane. In a construction which has been found to provide the required deflection and distribution characteristics the dimensions of the vanes are as follows:

Width of vane between plates 20	153 mm
Height of vane	58 mm
Thickness of upper edge of vane	11 mm
Thickness of lower edge of vane	8 mm
Width of apertures	31 mm
Height of apertures	36 mm
Spacing of apertures	7 mm
Angle of vane to the horizontal	70°

CLAIMS

1. Means for deflecting an airflow including: a vane having a front surface extending at an angle to an incident airflow to deflect the air and cause it to flow at an angle to the incident airflow and having a rear surface; and at least one aperture in the vane effective to reduce pressure differential between the front and rear surfaces.

2. A cabinet for housing electronic equipment including means to produce an airflow through the cabinet; a plurality of deflector vanes situated at locations within the cabinet and arranged to distribute and direct the airflow over the components, each vane being disposed at an angle to the incident airflow at its location and having at least one aperture effective to reduce pressure differential between opposite sides of the vane.

3. A cabinet as claimed in claim 2, in which the deflector vanes extend between spaced substantially vertically disposed guides.

4. Means for deflecting an airflow constructed and arranged to operate substantially as hereinbefore described with reference to the drawing.

5. A cabinet for housing electronic equipment, constructed substantially as hereinbefore described with reference to the drawing.

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